

**VOLTAGE RELAY  
PH-240t**

**VOLTAGE RELAY  
PH-263t**



## OPERATING MANUAL



*Quality control system on the development and production complies with requirements  
ISO 9001:2015*

**Dear customer,**

Company NOVATEK-ELECTRO LTD. thanks you for purchasing our devices.  
You will be able to use properly the device after carefully studying the Operating Manual.  
Keep the Operating Manual throughout the service life of the device.

**ATTENTION!** ALL REQUIREMENTS OF THIS OPERATING MANUAL ARE COMPULSORY TO BE MET!



**WARNING!** – DEVICE TERMINALS AND INTERNAL COMPONENTS ARE UNDER POTENTIALLY LETHAL VOLTAGE

TO ENSURE THE DEVICE SAFE OPERATION **IT IS STRICTLY FORBIDDEN THE FOLLOWING:**

- TO CARRY OUT MOUNTING WORKS AND MAINTENANCE **WITHOUT DISCONNECTING THE DEVICE FROM THE MAINS;**
- TO OPEN AND REPAIR THE DEVICE INDEPENDENTLY;
- TO OPERATE THE DEVICE WITH MECHANICAL DAMAGES OF THE CASE.

IT IS NOT ALLOWED WATER PENETRATION ON TERMINALS AND INTERNAL ELEMENTS OF THE DEVICE.

**ATTENTION! THE DEVICE IS NOT INTENDED FOR LOAD COMMUTATION AT SHORT CIRCUITS. THEREFORE, THE DEVICE SHOULD BE USED IN AN ELECTRICAL NETWORK PROTECTED BY AN AUTOMATIC TWO-POLE CIRCUIT BREAKER WITH A CUTOFF CURRENT OF MORE THAN 63 A, CLASS B.**

During operation and maintenance the regulatory document requirements must be met, namely:

- Regulations for Operation of Consumer Electrical Installations;
- Safety Rules for Operation of Consumer Electrical Installations;
- Occupational Safety when in Operation of Electrical Installations.

Installation, adjustment and maintenance of the device must be performed by qualified personnel having studied this Operating Manual.

**In compliance with the requirements of this Operating Manual and regulations the device is safe for use.**

This Operation Manual is intended to let you know about the device, safety requirements, operation and maintenance procedures for the Voltage relay PH-240t (Voltage relay PH-263t) (hereinafter in the text: a device, a voltage relay).

**Note** – Abbreviations PH-240t or PH-263t are used when characteristics of the types of voltage relays are different.

**The device meets the requirements of the following:**

- EN 60947-1;
- EN 60947-6-2;
- EN 55011;
- EN 61000-4-2.

Harmful substances, in more than allowed concentration, are not available.

**Terms and abbreviations:**

- controlled parameter – mains voltage and a parameter (variable) selected by the User (total power, active power, reactive power, load current), with exceeding of which the device opens the output contacts (Fig. 1);
- AR – delay of automatic re-closure which is counted down after opening of the output contacts (Fig. 1);
- display – a three-digit seven-segment indicator;
- QF - circuit breaker.

**1 DESIGNATION**

**1.1. Designation of the device**

The voltage relay is designed to protect household and industrial electrical equipment (refrigerators, air conditioners, washing machines, television, video and audio equipment, etc.) against unacceptable voltage fluctuations in the mains and the effects of a neutral (zero) conductor breakage.

The voltage relay:

- indicates the actual value of the voltage in the mains and the state of the output contacts (the state of the load);
- measures and displays current consumed by the load, active power and it trips off the load in case of exceeding the preset current threshold;
- saves information on five last failures in the non-volatile storage;
- has protection against overheating due to bad wire contact in the terminals as a result of dirt or insufficient clamping force.

The device may be used as a digital multimeter (indication of the mains voltage, active power and current consumed).

The device gets its supply from the circuit that supplies the load.

Table 1 shows characteristics of the output contacts of the voltage relay.

Table 2 shows ranges of parameters to measure and control.

Device version 5 adds double current reclosure (see section “Product operation”) and reduces the current protection tripping time to 2 seconds.

**Table 1** – Characteristics of the output contacts of the voltage relay

Description	PH-240t	PH-263t
Maximum switched current at active load, A	40	63
Maximum switched power at active load (cos φ = 1.0), kW	9	14
Maximum switched power at active-inductive load (cos φ =0.4), kW	1.6	2.0
Maximum allowable AC voltage, V	275	275
Service life:		
- mechanical, times, at least	500 000	500 000
- electrical, times, at least	20 000	10 000



**Table 2** – Ranges of the parameters to be measured and controlled

Name	Controlled range	Measured range
Active power, kW		0.1 – 14
Load current, A	1 – 63*	0.5 – 80
Input voltage, V	120 – 290	100 – 350
* Note: for PH-240t – 40 A		

### 1.2 Operation conditions

The device is designed for operation in the following conditions:

- Ambient temperature: from minus 35 to +55°C;
- Atmospheric pressure: from 84 to 106.7 kPa;
- Relative air humidity (at temperature of +25°C): 30 ... 80%.

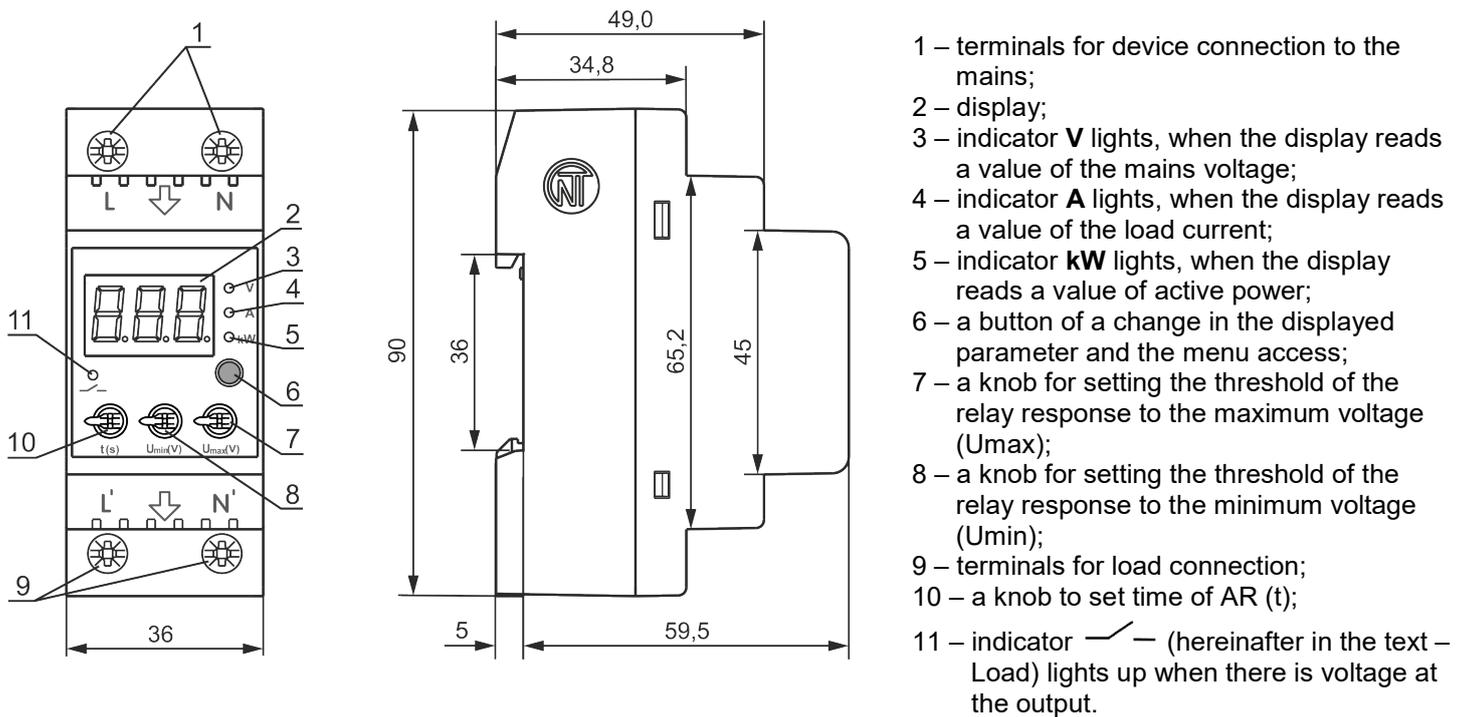
*If the temperature of a device after transportation or storage differs from the environment temperature at which it is expected to operate, then before connection to electric mains keep the device under the operating conditions within two hours (because the device elements may have moisture condensation).*

**ATTENTION! The device is not intended for operation in the following conditions:**

- Significant vibration and shocks;
- High humidity;
- Aggressive environment with content in the air of acids, alkalis, etc., as well as severe contaminations (grease, oil, dust, etc.).

### 1.3 Controls and overall dimensions of a device

Controls and overall dimensions are shown in Fig. 1.



**Fig. 1 - Controls and overall dimensions of the device**

## 2 TECHNICAL SPECIFICATIONS

The main technical specifications of the device are shown in Table 3. The preset parameters are given in Table 4.

**Table 3 - The main technical specifications**

Description	Value
Rated AC one-phase supply voltage, V	230/240
Mains frequency, Hz	47 – 65
Harmonic composition (unsinusoidality) of the supply voltage	EN 50160
Rated insulation voltage, V	450
Rated impulse withstand voltage, kV	2.5
Accuracy of active power measurement, %, not more	5
Accuracy of current measurement, %, not more	2.5
Accuracy of voltage measurement within the range of 120-350 V, % not more	2
Automatic re-closure time by voltage, s	5 – 900
Readiness time, s, not more	0.8
Consumed power at unconnected load, W, not more	2
Maximal voltage at which operability is retained (acting value), V	450
Minimal voltage at which operability is retained (acting value), V	100
Time of protection response by U <sub>max</sub> , s	1
Cutoff delay in case of overvoltage of more than 430 V and pulse duration more than 1.5 ms, s, not more	0.05

Table 3 (continued)

Description	Value
Cutoff delay in case of overvoltage of more than 30 V compared to preset value for U <sub>max</sub> , s	0.12
Time of protection response by U <sub>min</sub> , s	7
Cutoff delay in case of voltage decrease below 100 V, s	0.25
Accuracy of voltage threshold determination, V	3
Voltage hysteresis, V	4
Time of protection response to increase of the preset current threshold, s	5
Rated mode of operation	Long
Degree of device protection	IP10
Electric shock protection class	II
Climatic version	NF 3.1
Permissible pollution	II
Overvoltage category	II
Device version**	5
Wire cross section for connecting to terminals, mm <sup>2</sup>	0.5 – 16.0
The moment of tightening the screws of terminals, N·m	2±0.2
Mass, kg, not more	0.2
Overall dimensions, HxBxL, mm	90x36x60
Installation (wiring) of the device - standard 35 mm DIN rail	
The device retains its operability in any position in the space	
Material of the body frame - self-extinguishing plastic	
* At the mains voltage below 90 V and above 350 V the value of voltage measured by the device is not correct\$	
**The device version is subject to change	

Table 4 – Preset parameters

Name	Minimum value	Maximum value
Automatic re-close time by voltage, s	5	900
Response threshold by U <sub>min</sub> , V	120	230
Response threshold by U <sub>max</sub> , V	240	290
Response threshold by current*, A	1	40 (PH-240t) 63 (PH-263t)

\* **Note** – factory setting for PH-240t – 40A; for PH-263t – 63A

### 3 THE INTENDED USE

#### 3.1 Preparation for operation

##### 3.1.1 Preparation for connection:

- unpack and check the device for damage absence after transportation; in case of such damages detection, contact the supplier or the manufacturer;
- carefully study the Operation Manual;
- If you have any questions regarding the installation of the device, please contact the manufacturer by telephone number indicated at the end of this Operating Manual.

#### 3.2 General instructions

To ensure reliability of electrical connections, flexible (multi-wire) wires with voltage insulation of at least 450 V should be used.

The wire cross section for connecting protected equipment depends on the load current (power), and should be: for current of 40 A (9 kVA) – at least 6 mm<sup>2</sup>; for current of 63 A (14 kVA) - at least 16 mm<sup>2</sup>. The ends of the wires must be stripped of insulation for 5 ± 0.5 mm and crimped with bushings. Fastening of the wires should exclude mechanical damage, twisting and abrasion of wire insulation.

**ATTENTION! ALL CONNECTIONS MUST BE PERFORMED WHEN THE DEVICE IS DE-ENERGIZED.**

**Error when performing the installation works may damage the device and connected devices.**

**IT IS NOT ALLOWED TO LEAVE EXPOSED PORTIONS OF WIRE PROTRUDING BEYOND THE TERMINAL BLOCK.**

*For a reliable contact, tighten the terminal screws with the force indicated in Table 3.*

When reducing the tightening torque, the junction point is heated, the terminal block may be melted and wire can burn. If you increase the tightening torque, it is possible to have thread failure of the terminal block screws or the compression of the connected wire.

**3.3 Connect the input contacts of the device (Fig. 1, pos. 1) to the electric circuit via a two-pole circuit breaker.**

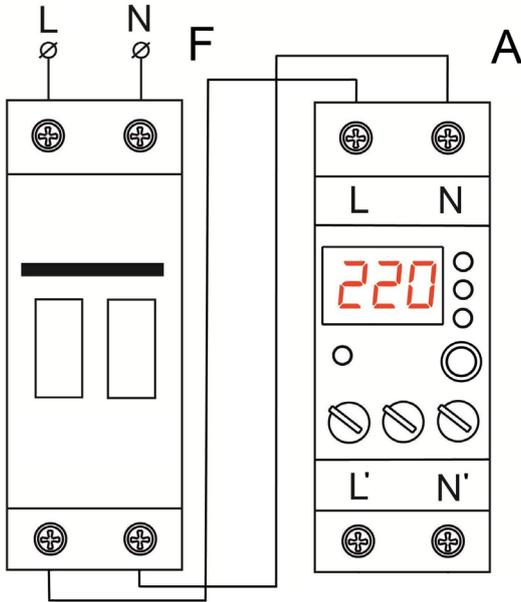
**Attention - compliance with phasing when connecting the device to the network is compulsory.**

**3.4** Connect the load to the output terminals of the device (Fig. 1, pos. 9).

**3.5** Check that the device is connected correctly.

**3.6** Using the knobs located on the front panel, set the maximum (**U<sub>max</sub>**) and minimum (**U<sub>min</sub>**) voltage values at which the device should operate (thresholds), as well as the automatic re-closure time (**t**). It is recommended to set the automatic re-closure time for air conditioners, refrigerators and other compressor devices for at least 180-250 seconds, for other equipment - according to their operating instructions.

~ 230 V 50 Hz



F – a circuit breaker;  
A – a voltage relay.

**Figure 2** – Device connection diagram

**3.7** Turn on the automatic circuit breaker to supply power to the device. "5tA" appears briefly on the display, followed by the countdown of the automatic re-closure time. When counting down the automatic re-closure time, the dot in the lowest digit of the display lights up and the indicator of the measured parameter flashes.

After the re-closure time has elapsed, if the voltage value of the network is within the limits set by the User, voltage will be applied to the output contacts of the device and the **Load** indicator will light up. The display will show the measured parameter (the one that was before disconnecting the device from the network), and the corresponding indicator will light constantly (Fig. 1, pos. 3 - 5).

To change the type of the measured parameter, briefly press the button. A flashing indication of the voltage value means that the voltage in the network is greater (or less) than the values specified by the User.

**3.8** If necessary, set the adjusted threshold values for the maximum (**U<sub>max</sub>**) and minimum (**U<sub>min</sub>**) voltages, as well as the automatic re-closure time. When the knobs are rotated, the value of the corresponding parameter is displayed simultaneously with the flashing of dots.

**3.9** To view information about the last five voltage failures, press and hold the button for more than 6 seconds until the inscription "AE-" appears on the display. After releasing the button, the alarm information will be displayed in accordance with Table 5.

**Table 5**

Procedure of information displaying	Information on the display	Time of information display, s	Notes
1	"1 = U"	1	"1" – the number of the last in time alarm " = U" – code of the alarm in case of maximum voltage
2	"2 4 5"	2	Voltage value at which alarm was recorded
3	"1 = I"	1	" = I" – code of failure in response to current
4	"1 0 2"	2	Value of current at which alarm was recorded
...	...	1	
...	...	2	
9	"5 = U"	1	" = U" - code of current failure
10	"1 7 5"	2	Value of voltage at which alarm was recorded

**Notes:**

- 1 - Information on the display is given as an example;
- 2 – In case of failure due to minimum voltage below 100 V, value "0" is recorded to the alarm event log;
- 3 – In case of maximum voltage alarm due to pulse overvoltage value 420 is recorded in the alarm event log.

**3.10** If necessary, set the required value of the current protection threshold. For this:

- press the button for more than 10 seconds until the inscription " = XX" appears on the display (appears 4 seconds after the inscription "AE-"), where "XX" is the preset threshold for the current protection, then release the button;

- pressing the button (or keeping the button pressed) for a short time, set the required value of the threshold;
- if no button is pressed for 4 seconds, the device will exit the threshold setting state and its value will be saved.

## 4 OPERATION OF THE DEVICE

**4.1** The device is in a state of normal operation if the mains voltage is within the limits set by the User and the automatic re-closure time has elapsed.

In this state, the protected equipment is connected to the network, the value of the selected parameter is displayed, the indicator of the corresponding parameter is constantly on, and the "LOAD" indicator is on.

**4.2** If the mains voltage exceeds the limits set by the User for a time longer than indicated in the technical specifications (see Table 3), then the device will go into a voltage alarm state.

In this state, the protected equipment is disconnected from the network, the "LOAD" indicator does not light, and the value of the monitored voltage is flashing on the display and the "V" indicator flashes.

After restoring the voltage parameters, the re-closure time countdown begins and the device enters the re-closure time indication state. In this state, the time in seconds remaining till the device enters the normal operation state is displayed, and a dot in the low-order digit of the display is lighting. After the automatic re-closure time has elapsed, the device goes into normal operation with voltage indication.

**4.3** If the load current exceeds the protection threshold set by the User for more than two seconds, the device will enter the current failure state.

In this state the protected equipment is disconnected from the mains, the "LOAD" indicator is not lit, the indicator "A" flashes. Within one second the indicator displays "=XX", where XX is the set current limitation threshold, then within one second the current value at which the fault occurred, and then the current reclosure time countdown. The current reclose time is the same as the voltage reclose time, but not less than 20 seconds.

After the reclosure time is completed, the device enters the normal operation state with current indication.

If a second current fault occurs within 10 seconds after switching on, the current reclosure cycle will be repeated. If after the second attempt of switching on, a current fault occurs again, the reclosure will be blocked, and with flashing indicator "A", the display will alternately show the code "=XX", where XX is the set current limit threshold and the current value at which the fault occurred. In this case, to continue operation it is necessary to eliminate the cause of the fault and briefly press the button (in this case, the device will go to normal operation mode taking into account the remaining reclosure time) or disconnect the device from the mains with a circuit breaker and reconnect it to the mains.

**4.4** When the protection against overheating of the contact group (temperature above 85 °C) is activated, the protected equipment will be disconnected from the mains, the load-on indicator does not light, and the code «E-T» is displayed in the flashing mode.

To resume the device operation, it is necessary to disconnect the device from the mains, check for contamination of the contacts, check for reliability of the connection of wires, if necessary, clamp them with the force specified in Table 3. Then, turn the device on again.

If this failure repeats, then the device should be removed from service and sent for repair.

## 5 MAINTENANCE

### 5.1 Safety precautions



**THE TERMINALS AND THE DEVICE INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE. DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE DEVICE AND CONNECTED DEVICES FROM THE MAINS.**

**5.2** Recommended frequency of maintenance is **every six months**.

### 5.3 Maintenance Procedure:

- 1) Check the connection reliability of the wires, if necessary, clamp with the force specified in Table 3;
- 2) Visually check the integrity of the housing, in case of detection of cracks and damages take the device out of service and send for repair;
- 3) If necessary, wipe the front panel and the housing of the device with cloth.

*Do not use abrasives and solvents for cleaning.*

## 6 TRANSPORTATION AND STORAGE

The device in the original package is permitted to be transported and stored at the temperature from minus 45 to +60 °C and relative humidity of no more than 80 %.

## 7 SERVICE LIFE AND MANUFACTURER WARRANTY

**7.1** The lifetime of the device is 10 years. Upon expiration of the service life, contact the manufacturer.

**7.2** Shelf life is 3 years.

